

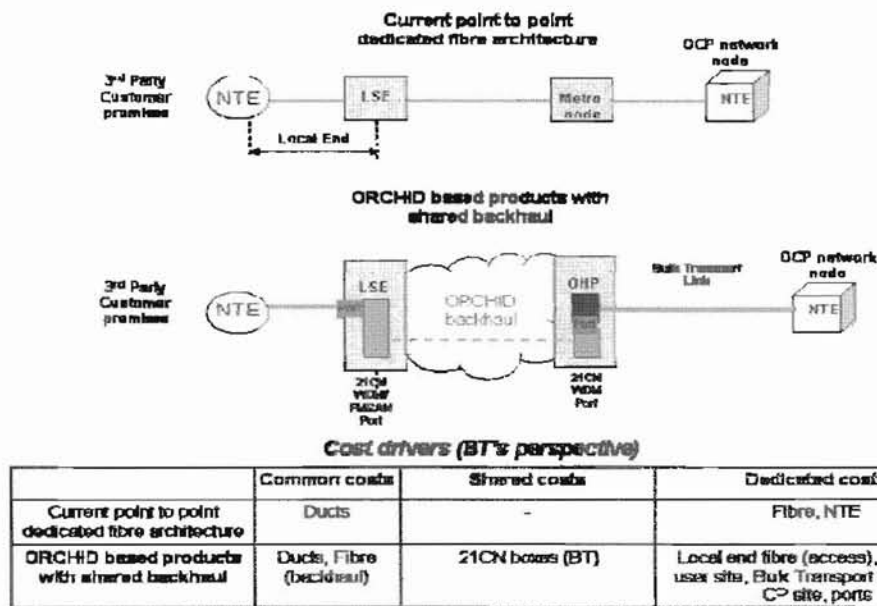
migration from <2.5Gbps to 2.5Gbps or 10Gbps, or from 2.5Gbps to 10Gbps, requires NTE change. The cost of moving from a low bandwidth (up to 1Gbit/s) circuit to a high bandwidth (over 1Gbit/s) circuit is therefore likely to be significantly higher than the cost of substituting one circuit within the low bandwidth market for another within that market but of different bandwidth.

- 3.129 In addition, users of Ethernet interfaces are able to benefit from scale economies arising from the very high volumes of Ethernet components used in carrier and enterprise markets. The volume of SDH interfaces sold is however much smaller than Ethernet and growing at a much smaller rate, if at all. As a consequence one would expect the cost of Ethernet components to be declining whereas the cost of SDH components is likely to be static or possibly increasing.
- 3.130 The forward looking analysis seems therefore to indicate that the difference in the cost of equipment between 1 Gbit/s and 2.5 Gbit/s AI circuits is unlikely to disappear, as the costs of the underlying hardware and software are not likely to converge.

Impact of ORCHID

- 3.131 With project ORCHID underway, BT is moving its wholesale Ethernet portfolio from a point to point dedicated architecture to a shared (backhaul) architecture. This move is likely to result in a significant change in the cost structure and cost drivers of high bandwidth AI services. The figure below shows at a high level BT's view of how the transition will affect the cost and structure of service provision.

Figure 3.2: Impact of ORCHID on cost structure



Source: Ofcom, November 2008.

- 3.132 AI circuits are currently provided using point to point dedicated fibre. The costs of fibre and NTE are therefore incremental to the provision of a circuit to a particular customer. However, of these, only the cost of the NTE varies according to the bandwidth of the circuit. Our analysis above shows that it is the incremental cost of

(predominantly) the NTEs between a 1 Gbit/s and a 2.5 Gbit/s circuit that drives the difference in the cost of provision.

- 3.133 In BT's methodology, duct is treated as a common cost, that is, a cost which is not incremental to the provision of a particular service (or circuit) but is instead caused by the provision of a number of different services among which it is common. In general, there may be no uniquely correct way to allocate common costs among these services. However, it is frequently the case that they are allocated in proportion to incremental costs. If incremental costs do not vary with bandwidth, then neither will common costs if these are allocated proportionately. For this reason, the costs of current AI services have been assumed to be largely invariant to bandwidth, apart from the cost of the NTE. If this pattern of costs is reflected in the competitive level of prices, these will also not increase strongly with bandwidth, except to the extent that they reflect NTE costs.
- 3.134 Project ORCHID is expected to have two main effects on costs, and hence our view of the competitive price of AI services. Firstly, the overall cost of provision of circuits at all bandwidths is expected to be reduced. Secondly, and potentially of greater importance for AI market definition, a higher proportion of costs will be shared between a number of products and services. In particular, the cost of backhaul will fall into this category, as will the cost of BT's 21CN equipment. The access fibre and the NTE on the end user's site remain dedicated costs (i.e. are incremental to the demands of individual subscribers).
- 3.135 The key issue for our SSNIP analysis is then to identify which costs vary with bandwidth and by how much are the costs of supplying high bandwidth circuits greater than the costs of supplying low bandwidth circuits. As now, only the cost of NTE among the "dedicated costs" is thought to vary significantly with bandwidth. We have therefore focussed on the cost of shared backhaul.
- 3.136 Once ORCHID is implemented, the same backhaul infrastructure will be used to provide circuits of different bandwidths (in contrast to the point to point dedicated fibres currently used). Given that the maximum capacity of the backhaul infrastructure will then be fixed in the short-run, the use of (part of) this capacity for one service will then prevent it being used for another service, and the greater the bandwidth used for the first service the less will be available for other services. The short-run marginal cost of additional capacity (bandwidth) may then be quite high, where capacity is already fully used. In the long-run of course, capacity is not fixed and in fact on an NGN additional capacity can be installed at relatively low marginal cost. But there would still be a tendency for the cost of a circuit to increase with the bandwidth of that circuit. Then, if we assume that the competitive price for backhaul reflects the costs of provision, these prices will also be positively related to the bandwidth of the circuit.
- 3.137 Moreover, whilst it is theoretically efficient for prices to equal marginal costs, since on an NGN there are significant economies of scale, average costs are above marginal costs and so setting prices at marginal cost will result in losses. This would be unsustainable in a competitive market. Identifying the most efficient way of setting prices to recover total costs in these circumstances is a complex issue but it will generally be efficient for prices to be related to (peak) capacity used. One possibility is that multi-part tariffs combining fixed and capacity-related elements could be used. Further discussion of this issue is beyond the scope of this review but, for our purposes, the key point is that the competitive price of shared backhaul is likely to exhibit a significant bandwidth related component.

- 3.138 ORCHID is therefore, if anything, likely to result in a somewhat greater tendency of costs and hence competitive price levels to increase with bandwidth than at present. This is because firstly, it is likely that the largest reductions in costs will be in network costs. This means that NTE costs, which vary strongly with bandwidth (at least above 1Gbit/s), may form a higher proportion of total costs. And secondly, the cost of shared backhaul is also likely to vary with bandwidth. Lastly, additional equipment (21CN boxes) costs will also be shared.
- 3.139 It follows that switching from 1 Gbit/s to 2.5 Gbit/s will not only incur the incremental cost of the NTE at the end users' sites, but also a significant incremental cost for migrating across bandwidths between 1 Gbit/s and 2.5 Gbit/s. This supports the view that the migration to ORCHID-based products will not per se imply a lower incremental cost between 1 Gbit/s and 2.5 Gbit/s services, to an extent sufficient to imply that Ofcom should revise its proposed market definition.

Pricing above cost

- 3.140 One respondent commented that BT's ability to use value-based pricing suggests that all circuits are in the same market. However, Ofcom believes that it is not possible to make this inference. This is because, for two services to be in the same market they must usually be either demand or supply-side substitutes. The observation that prices may be value-based does not establish that either is the case and indeed value-based pricing is a form of price discrimination which is only sustainable if such substitution is at least to some extent limited. This is because, if two products were perfect substitutes, any attempt to set charges on the basis of customer valuations would result in some customers switching to the lower priced service, or in some customers reselling to others (arbitrage). This would tend to undermine any attempt to price on the basis of value. Therefore, the use of value-based pricing is not inconsistent with the finding of separate markets at low and high bandwidths.

Size of the market

- 3.141 The alleged small size of the high bandwidth market – estimated by UKCTA at 2200 circuits in 2006 compared to 36500 for the low bandwidth market - appears to rest on a circuit count. In revenue terms, the relative size of the high bandwidth market would be somewhat greater. The market is anyway clearly of sufficient size not to be regarded as *de minimis* and to avoid instability caused by "small number problems".
- 3.142 One operator repeated this point in its response to the July 2008 consultation, even though this issue was not discussed there. It did not raise any new arguments but suggested that Ofcom should keep the issue under review.

Future developments in competitive conditions

- 3.143 Some respondents, particularly C&W, have suggested in their responses to the January 2008 consultation, that the market for circuits above 1Gbit/s is currently concentrated in London and other major urban areas where a number of competing operators have their own infrastructure. Once the demand for circuits above 1 Gbit/s grows in areas where alternative infrastructures are less well developed, these operators argue that competitive conditions in the high bandwidth AI market will come to resemble those in the low bandwidth market.
- 3.144 The point made by respondents is potentially relevant to the definition of the geographic area covered by the market (discussed in Section 6), as well as the

product market. The gist of these respondents' argument is that the underlying competitiveness of AI markets differs according to geography. At present, demand for high bandwidth circuits is concentrated in areas where provision is likely to be competitive. This means that competitive conditions in the high bandwidth market appear to be significantly different to those in the low bandwidth market, demand for which is more geographically widespread. However, these respondents argue, demand for high bandwidth circuits will in time also spread to areas where there is less scope for competitive provision, and competitive conditions will then come to resemble those in the low bandwidth market. This would then remove one of Ofcom's reasons for regarding low and high bandwidth AI circuits as separate product markets.

3.145 We have considered this issue, and in particular how likely it is that in the lifetime of this review a significant demand for circuits above 1 Gbit/s would appear outside major urban areas. Our conclusion is that this is unlikely to happen, for the following reasons:

- applications that require such high bandwidths tend to be concentrated in urban areas where large users such as financial institutions and government offices are located;
- demand for LLU backhaul in dense traffic areas is currently being met with circuits of speeds up to 1 Gbit/s, with investments for the forthcoming years now concentrating on 1 Gbit/s circuits. There does not seem to be a significant actual or prospective demand for LLU backhaul at higher bandwidths; and
- demand for broadband in other areas, where the lower ability to exploit economies of scale makes LLU generally less attractive, is currently being met largely by use of bitstream access. This is unlikely to change in the near future.

Revised market share analysis

3.146 We discuss our market share analysis briefly here because market shares are one indicator which we have used to identify differences in competitive conditions between low and high bandwidth retail AI markets, and this is relevant to market definition. As noted above, even in the absence of demand or supply-side substitution, it might still be reasonable to analyse low and high bandwidth circuits as a single market, provided competitive conditions were sufficiently homogeneous.

3.147 We estimated in January that BT's share of the retail low bandwidth AI market was 72% whilst its share of the retail high bandwidth market was 13%. Ofcom's calculations suggested that BT's share of the wholesale high bandwidth AISBO market was 26%, compared to 73% for low bandwidth AISBO, reflecting the much greater investment in competing infrastructures which has taken place in the high bandwidth market.

3.148 Ofcom has revised these figures and now estimates that BT's share of the high bandwidth AISBO market at December 2006 was 49% rather than 26% (the figure in the consultative document). The figure has increased because of the reallocation of COLT and Vtesse circuits, as a result of submissions by these operators. Ofcom has also attempted to obtain a more up-to-date view of competition in the market by estimating BT's market share at April 2008. The results show that BT's market share is likely to lie between 38% and 40%, a decrease compared to December 2006.

- 3.149 As noted above, this is primarily relevant to the SMP analysis at the wholesale level and is discussed further in Section 7. It is relevant to market definition insofar as it suggests that the extent of the difference in competitive conditions between low and high bandwidth retail markets may have been overstated in the consultative document. However, given the differences which remain even after the recalculation, the conclusion that competitive conditions are not homogeneous appears robust. This is particularly so given that entry barriers into the high bandwidth market are relatively low, for example because the costs which must be sunk in order to enter the market are smaller relative to the revenues available than in the low bandwidth market. The robustness of this conclusion is borne out by the entry into this market of two new suppliers since December 2006.

Conclusions on low and high bandwidth AI markets

- 3.150 The weight of evidence suggests that a significant cost (and hence, in a competitive market, price) differential is likely to remain between circuits at bandwidths up to 1Gbit/s and circuits at higher bandwidths. This is not likely to be significantly affected by the implementation of BT's Project ORCHID. This suggests that customers are unlikely to be willing to switch between low and high bandwidth circuits in response to a SSNIP above the competitive price to an extent sufficient to render that SSNIP unprofitable. Moreover, competitive conditions in the two markets appear to differ significantly (as indicated by both quantitative and qualitative factors) and appear likely to continue to do so.
- 3.151 In the light of this Ofcom believes that the market definitions set out in the January Consultation Document remain appropriate. It therefore proposes to define a market for low bandwidth AI circuits including circuits of up to and including 1Gbit/s capacity and a market for high bandwidth AI circuits including circuits of over 1Gbit/s capacity.

CCTV Circuits

- 3.152 BT has notified us that it is considering a new pricing initiative in relation to the CCTV Access products launched by Openreach on an EOI basis in March 2008. These products are used to provide CCTV services to local authorities and the police, amongst others. BT has informed us that it is considering some significant price reductions for CCTV Access products to reflect their importance to public security and the potential impact that end customers' budgetary constraints would otherwise have on demand.
- 3.153 In order to reach a view on the implications of such price reductions, Ofcom would need to consider in which market CCTV Access circuits are provided and whether there are any potential effects on competition in that market.
- 3.154 For the purposes of this market review, Ofcom has not included the supply of CCTV Access circuits within the low bandwidth AISBO market or any of the other markets covered by the review. On the basis of the evidence currently available to us, we believe that this is likely to be consistent with the application of Ofcom's standard approach to market definition. Under this approach, market definition is determined primarily by the extent of substitutability between products, though the existence of common pricing constraints and uniform competitive conditions may also be taken into account.
- 3.155 CCTV circuits are in many ways technically similar, but are not identical to, a WEES, which is included in the AISBO market. The key difference is in the type of NTE used. Ofcom believes that the differences between the NTE used for WEES and CCTV Access circuits and the costs of making the necessary adaptations are likely to limit

demand-side substitution between them, to an extent which means they could be regarded as being in separate markets. For supply-side substitution to be relevant to market definition, there must be providers of AISBO circuits, not currently supplying CCTV Access circuits, who would start supplying the latter rapidly and at low incremental cost in response to an increase in price above the competitive level. The extent of the technical similarity of WEES and CCTV Access circuits may suggest that supply-side substitution is, in theory, possible but is not in itself sufficient to establish that they are part of the same market. In addition, CCTV Access circuits and WEES do not appear to be subject to a common pricing constraint and market share data suggests that there are some differences in competitive conditions.

- 3.156 As will be apparent from the above, we do not propose as part of this market review to apply ex ante regulation to the CCTV Access products supplied by Openreach. In addition, even if CCTV Access circuits were found to be part of the AISBO market, we would not necessarily regard a difference in pricing between CCTV Access and WEES as being a breach of the No Undue Discrimination obligation applicable to WEES in the wholesale market for low bandwidth AISBOs.
- 3.157 One of the relevant considerations here would be whether differential pricing would restrict or distort competition in the relevant downstream markets. Given their different uses, and as moreover both CCTV Access and WEES are provided on an EOI basis, we consider it unlikely, based on the evidence currently available to us, that a difference in pricing between CCTV Access and WEES would necessarily restrict or distort competition in the relevant downstream markets, although we cannot of course fetter our discretion on this point.
- 3.158 We could also take account of the value to the public of CCTV Access services when considering the appropriateness of any proposed charges. We note Openreach's view of the value of CCTV services in enhancing public safety and security.

Review of proposals and conclusions

- 3.159 In light of responses to the January and July 2008 consultations, summarised in the above discussion, we have concluded that the following retail market definitions are appropriate:
- Low bandwidth TI retail market;
 - High bandwidth TI retail market;
 - very high bandwidth TI retail market – over 45Mbit/s and up to and including 155Mbit/s;
 - very high bandwidth TI retail market -- over 155Mbit/s;
 - Low bandwidth AI retail market; and
 - High bandwidth AI retail market.
- 3.160 These markets are set out in tabular form below.

Table 3.3: Summary of retail product market definitions

Retail product markets	Bandwidth breaks			
TI retail leased lines	Low Up to and including 8Mbit/s (including analogue and SDSL services)	High Above 8Mbit/s up to and including 45Mbit/s	Very high 155 Above 45 Mbit/s and up to and including 155 Mbit/s	Very high 622 Above 155 Mbit/s
Alternative interface leased lines	Low Up to and including 1Gbit/s		High Over 1 Gbit/s	

Section 4

Retail geographic market definition

Introduction

- 4.1 In this Section we first summarise the proposals in relation to the retail geographic market definitions set out in our January and July 2008 consultations. We then set out and respond to stakeholders' responses to these proposals before providing our conclusions in relation to the retail geographic market definitions for leased lines markets in the UK.

Summary of proposals

January 2008 consultation

- 4.2 In the January 2008 consultation document we conducted a detailed geographic market analysis for each of the retail product markets defined (as summarised in Section 3 above). As with retail product market definition, retail geographic market definition is useful in this market review as it can be informative of the scope of the relevant wholesale markets.
- 4.3 Ofcom's analytical framework for defining the geographic scope of the relevant retail markets was explained in detail in Section 4 of the January 2008 consultation document. This explained that there would be a separate geographic market for each of the relevant product markets in the Hull area. For the rest of the UK, Section 4 explained why, for leased lines markets, an analysis of demand-side and supply-side substitution will generally lead to the definition of very narrow geographic markets and thus is not relevant to assessing the geographic market definition. In this light, Ofcom's analytical framework for the UK (excluding the Hull area) focussed on the presence of common pricing constraints and geographic variations in competitive conditions.
- 4.4 Ofcom's retail geographic analysis had three main elements:
- an analysis of retail service shares on a postal sector basis, using retail circuit information provided by operators;
 - consideration of consumer survey evidence which found that around half of businesses use more than one supplier to provide business connectivity services, with the propensity to do so positively correlated with business size; and
 - consideration of BT's pricing policies, which can inform the extent to which there exists a common pricing constraint across geographic areas.
- 4.5 As this market review is primarily considering competition in wholesale markets (with the exception of the low bandwidth TI retail market) it is not necessary for Ofcom to reach definitive conclusions on the precise scope of the various retail markets. Table 4.1 below summarises the proposed geographic market boundaries in the UK (excluding the Hull area) set out in the January 2008 consultation document for each of the retail product markets considered.

Table 4.1: Summary of proposed retail geographic market definitions in the January 2008 consultation document

Retail product market	Proposed geographic definition
Low bandwidth TI leased lines	The UK (excluding the Hull area)
High bandwidth TI leased lines	Inconclusive whether the market is national, the UK (excluding the Hull area), or local in scope
Very high bandwidth TI leased lines	Inconclusive whether the market is national, the UK (excluding the Hull area), or local in scope
Low bandwidth AI leased lines	Evidence of geographic variations in competitive conditions which might suggest the market is local in scope
High bandwidth AI leased lines	The UK (excluding the Hull area)

July 2008 consultation

4.6 In the July 2008 consultation document we assessed the geographic scope of the relevant markets for each of the two revised retail product markets: the very high bandwidth 155Mbit/s TI retail leased lines market and the very high bandwidth 622Mbit/s TI retail leased lines market. The conclusion of the retail analysis was inconclusive as to whether the geographic scope of these product markets was national or local. However, we noted that as the consultation was concerned with reviewing the related upstream wholesale markets for these services, it was not necessary for us to reach a definitive conclusion on these questions. Our proposed retail geographic market definitions from the July 2008 consultation document are summarised in Table 4.2 below.

Table 4.2: Summary of proposed retail geographic market definitions in the July 2008 consultation document

Retail product market	Proposed geographic definition
Very high bandwidth 155Mbit/s TI leased lines	Inconclusive whether the market is national, the UK (excluding the Hull area), or local in scope
Very high bandwidth 622Mbit/s TI leased lines	Inconclusive whether the market is national, the UK (excluding the Hull area), or local in scope

Review of responses to the consultations and Ofcom's response

4.7 In the January 2008 consultation, we asked the following questions:

Question 3: Do stakeholders agree with our proposed approach to geographic market definition?

Question 4: Do stakeholders agree with our proposed retail geographic market definitions?

4.8 In the July 2008 consultation we did not ask a specific question relating to the retail geographic market definition, but a broader question in relation to the definitions of the separate 155Mbit/s and 622Mbit/s TI retail leased lines markets.

Summary of responses

- 4.9 We summarised and responded to the issues raised by respondents to the January 2008 consultation in the July 2008 consultation. For ease of reference, these are repeated below. We received no specific responses to the July 2008 consultation on the issue of retail geographic market definition.
- 4.10 BT, in its response to the January 2008 consultation agreed with the approach of identifying geographic areas with similar competitive conditions to inform geographic market boundaries. However, BT disagreed that national pricing can be indicative of a national market and do not consider Ofcom's approach to be consistent with the European Commission's guidance. In particular, BT argued that it cannot be the case that pricing decisions of one supplier can define the scope of a market.
- 4.11 C&W in its response argued that it is not practical to undertake geographic analysis in retail leased lines markets. This is because the products in these markets are point to point in nature and as such any analysis has to be undertaken on the combination of the two ends of the circuit. This point was also raised by 2 CPs.
- 4.12 KCOM, UKCTA and two CPs questioned whether it remains appropriate to define the Hull area as a separate geographic market at the retail level as very few leased lines would have both ends located within the relevant geographic area.

Ofcom's response

- 4.13 Ofcom disagree with BT that national pricing cannot be indicative of a national market. Where common pricing constraints exist this can have the effect of extending the constraints present in one geographic area into other geographic areas where the common pricing constraint is present. However, that is not to say that if a single operator were to change its pricing policies and begin to charge on a local basis that the market would automatically become local. The motivations for the change in pricing policy would need to be understood, for example, to explore whether there is evidence that the change was motivated by geographic variations in competitive conditions. Moreover, it would not necessarily be the case that the geographic area over which prices are the same would constitute the boundary of the relevant market.
- 4.14 Ofcom also disagrees that consideration of pricing policies and common pricing constraints is inconsistent with the European Commission's guidance. Common pricing constraints can indicate the geographic areas in which competitive conditions

are similar. Moreover, Ofcom notes for example the European Commission's comments letter to the Austrian NRA, on its notification of its analysis for the wholesale broadband access market in Austria²⁹. The European Commission in its comments letter recognised the relevance of national pricing in the NRA's decision to define the geographic scope of the market as national³⁰.

- 4.15 On the point made by a number of respondents that retail markets should be national, Ofcom disagrees. The scope of the relevant markets should be defined in reference to the available evidence. This remains the case when assessing whether markets are local, even if this is more complex/ less practical than defining the markets to be national. In addition, Ofcom recognises that retail leased lines have two ends which, by definition are in different locations, but does not consider that this precludes the finding of local retail markets.
- 4.16 Similarly, Ofcom considers that the evidence continues to suggest that a local geographic market exists in the Hull area for retail leased lines. There is a separate network in the Hull area and there are different constraints present in the Hull area compared to the rest of the UK.

Conclusions

- 4.17 After careful consideration of the comments received in response to the January 2008 consultation, Ofcom sees no reason to amend its conclusions of its geographic analysis of the various retail product markets considered in this review which are summarised in Table 4.1 and Table 4.2 above. That said, Ofcom again notes that this market review is primarily concerned with assessing competition in wholesale markets and as such it is not necessary for Ofcom to reach definitive conclusions on the precise scope of the various retail markets (with the exception of the low bandwidth TI market).

²⁹

http://circa.europa.eu/Public/irc/info/ecctf/library?l=/sterreich/registeredsnotifications/at20080757/at-2008-0757_enpdf/ EN 1.0 &a=d

³⁰ Page 7.

Section 5

Wholesale product market definition

Introduction

5.1 In this Section, we first summarise the wholesale product market definitions set out in our January and July 2008 consultations. We then set out and respond to stakeholders' responses to these proposals before providing our conclusions with regard to the appropriate wholesale product market definitions for leased lines markets in the UK.

Summary of proposals

5.2 We set out in Table 5.1 below the wholesale product markets we have defined for the purposes of this review. Our conclusions on market definition are the same as those proposed in our January 2008 consultation, except in the case of the very high bandwidth TISBO markets where we have adopted the revised definition proposed in the July 2008 consultation.

Table 5.1: Summary of proposed wholesale product market definitions in the January 2008 consultation, as modified in the July 2008 consultation

Wholesale product markets	Bandwidth breaks			
TI symmetric broadband origination (TISBO)	Low Up to and including 8Mbit/s (including analogue and SDSL services)	High Above 8Mbit/s up to and including 45Mbit/s	very high-155 Above 45 Mbit/s up to and including 155Mbit/s	very high-622 Above 155 Mbit/s
Alternative interface symmetric broadband origination (AISBO)	Low Up to and including 1Gbit/s		High Above 1 Gbit/s	
Trunk segments (SDH/PDH)	All bandwidths			

General approach to wholesale market definition

5.3 As discussed in Section 3, the relevant market boundaries are determined by identifying constraints on the price setting behaviour of firms. Our assessment of competitive constraints at the wholesale level has been informed by the proposed retail market definitions. This is because the demand for the wholesale service is a derived demand, i.e. the level of demand for the wholesale input depends on the demand for the retail service.

- 5.4 In some cases, a wholesale leased line service may be used as an input to a number of markets that are defined as separate at the retail level (and potentially outside the scope of the retail leased line market). We have therefore sought to take into account the possible use of these wholesale inputs in these downstream retail markets.
- 5.5 Our market definition assessment has also been conducted on the assumption that there is no SMP-based regulation in the relevant wholesale markets under review. However, any wholesale regulation in markets upstream of these markets, or which exists independently of a finding of SMP in the markets being reviewed (e.g. BT's Local loop unbundling obligations) has been taken into account. Existing regulations which are not conditional on a finding of SMP in the business connectivity markets under review are assumed to be in place when assessing our wholesale product market definition.

January 2008 consultation

- 5.6 In the January 2008 consultation document, we conducted analysis to assess the relevant wholesale product market definition, taking into account our proposed retail product market definitions. The proposed definitions in our January 2008 consultation document reflected our consideration of six key wholesale product market definition issues:

1. Wholesale access and backhaul markets: does a combined market for access and backhaul exist?
2. Symmetric broadband origination (alternative versus TI): can specific SBO product markets be identified for AI and TI services?
3. Symmetric broadband origination (used to support other retail services): should wholesale inputs (such as LLU backhaul and RBS backhaul) used to support other downstream retail markets be included in relevant SBO markets?
4. Wholesale trunk market(s): does a separate market for trunk segments exist and where should the break between trunk and SBO be identified?
5. Trunk versus alternative conveyance: do other forms of "core" connectivity such as broadband conveyance provide a competitive constraint on trunk services used for leased lines?
6. Bandwidth: what are the appropriate bandwidth breaks, if any, for trunk and SBO services?

1. Wholesale access and backhaul markets: does a combined market for access and backhaul exist?

- 5.7 In the January 2008 consultation document, we proposed to find a combined market for access and backhaul, which we referred to as "symmetric broadband origination" (SBO). Although BT is beginning to offer separate access and backhaul products, we suggested that in general CPs would continue to purchase access and backhaul together (i.e. as a combined product). We thought that the likelihood that separate access and backhaul markets would emerge would be limited by a number of factors. In particular, we thought that opportunities to combine different traffic streams, which are currently conveyed over service-specific platforms, over the same (converged) backhaul links would remain limited. We therefore proposed to define markets for symmetric broadband origination (combined access and backhaul) services as, in the

most part, access and backhaul are likely to continue to be procured together over the timeframe of this review.

2. Symmetric broadband origination (AI versus TI): can specific SBO product markets be identified for AI and TI services?

- 5.8 We proposed to define two forms of symmetric broadband origination (AI and TI) referred to respectively as AISBO and TISBO services. The identification of these two sets of wholesale markets primarily reflected the distinction we made between AI and TI services at the retail level. We also considered there to be a lack of evidence of any direct constraints at the wholesale level (arising either from demand-side and or supply-side substitution).

3. Symmetric broadband origination (to support other retail services): should wholesale services used to support LLU and RBS backhaul be included in relevant SBO markets?

- 5.9 We considered whether specific wholesale services, for example those used to support LLU and as part of mobile networks (e.g. RBS backhaul, microwave backhaul links) should be included in either of the AISBO and TISBO markets. We considered that the wholesale services employed for example for RBS backhaul were essentially the same as those captured by our TISBO and AISBO definitions. We also considered that competitive conditions were broadly similar to those seen respectively for other Wholesale AISBO and TISBO services. We therefore proposed that LLU backhaul should fall in the appropriate AISBO market and RBS backhaul in the appropriate TISBO market.

4. Separate wholesale trunk market(s): does a separate market for trunk segments exist and where should the break between trunk and SBO be identified?

- 5.10 We proposed to define separate markets for trunk circuits and TISBO circuits. We based our proposed market definition primarily on:
- the complementary nature of trunk and terminating segments (pointing to an absence of demand- and supply-side substitution);
 - differences in competitive conditions reflecting the far greater potential for CPs to realise economies of scale in trunk; and
 - the fact that a significant number of CPs do not acquire trunk as part of a bundle with terminating segments.
- 5.11 Given that we proposed a separate trunk market, a particular issue was how to identify the precise location of the boundary between trunk and TISBO markets. In the 2003/04 Review, we based the break point between trunk and TISBO on the location of particular core nodes on BT's network, namely its Tier 1 nodes. We highlighted in the January 2008 consultation that defining the scope of the trunk market based on BT's Tier 1 nodes was not an ideal solution.
- 5.12 We were concerned, in particular, that Tier 1 nodes are specific to BT's network and can reflect its historical decisions over where to locate network nodes. These network locations may not necessarily be optimal network points for OCPs. We observed, for example, that many CPs had apparently not built out to all of BT's Tier 1 nodes. This

suggested that it is not economically viable for CPs to build their trunk networks beyond a certain point and certainly not to all of BT's Tier 1 nodes.

- 5.13 We explained that the trunk definition should seek to capture the way in which operators build networks in order to benefit from opportunities for traffic aggregation and hence exploit economies of scale. Many CPs have built core networks linking main population centres. Hence, most CPs will have points of presence in those main population centres to collect traffic from customers and convey this over their own core networks. However, in most circumstances, a CP would not be likely to locate (i.e. interconnect with BT) at more than one Tier 1 node in close proximity to another Tier 1 node within the same urban area. Only where there was a sufficient volume of traffic with a particular urban centre could there be sufficient opportunity to exploit economies of scale to justify additional interconnection.
 - 5.14 We therefore wanted to define the break between trunk and terminating markets in a way which more accurately reflects the likely boundary between the more competitive trunk routes connecting urban centres, and the less competitive terminating segments distributing traffic to customer premises within these centres. This does not of course mean that all trunk routes are necessarily competitive, or that all SBO markets are necessarily uncompetitive. But it is consistent with the idea that competitive entry is more likely where entrants are able to benefit from economies of scale by aggregating traffic onto their own high capacity links..
 - 5.15 In light of the above observations regarding where CPs were likely to build trunk, we therefore proposed to identify a consolidated set of nodes, which we referred to as "aggregation nodes". However, given that the identification of these aggregation nodes was inherently reliant on geographic analysis (for example locations of major population centres), we examined the precise location of aggregation nodes in our analysis of wholesale geographic market definition (this is discussed in Section 7).
- 5. Trunk versus alternative forms of conveyance: do other forms of "core" connectivity such as broadband conveyance provide a competitive constraint on trunk services used for leased lines?**
- 5.16 In the January 2008 consultation, we assessed whether trunk used to provide circuits for the TI market (referred to as SDH/PDH trunk) would form part of the same market as other forms of "core" connectivity. We proposed to define a separate market for trunk segments used to support SDH/PDH services. Our assessment was that suppliers could not easily switch from SDH/PDH trunk to other broadband conveyance technologies or vice versa. It was therefore unlikely that a hypothetical monopolist of SDH/PDH trunk supply seeking to impose a SSNIP would be constrained by substitution at the wholesale level to other forms of core connectivity.
 - 5.17 In addition, as we have concluded that TI leased lines services are in separate markets from other services (see Section 3) at the retail level, it is also unlikely that we would include different types of core connectivity in the same market via an indirect constraint. An indirect constraint would be relevant if a hypothetical monopolist seeking to impose a SSNIP on trunk services was constrained due to substitution at the retail level arising from the increase in wholesale trunk charges being passed through in retail prices. However, as we proposed to find that retail services served by SDH/PDH trunk are in a separate market to other business connectivity services served by broadband conveyance, an indirect constraint would not arise. We therefore proposed to define a separate SDH/PDH trunk market.

- 5.18 In addition to finding a separate market for SDH/PDH trunk, we proposed not to identify a specific AI trunk market. This was because AI retail services were (and are) not currently provided using trunk segments (although longer distance Ethernet circuits can be provided over SDH bearers; and BT's "Megastream Ethernet" services, for example, use its ATM network).
- 5.19 We considered that deployment of Ethernet trunk was unlikely until the development and roll-out of carrier class Ethernet. Carrier-class Ethernet is a superior Ethernet standard being developed to overcome the traditional limitations of the current Ethernet standard in wide area networks. It would enable core connectivity for Ethernet services to support carrier-class SLAs/SLGs essential for many business connectivity customers.
- 5.20 We noted that the timing of the deployment of carrier-class Ethernet is highly uncertain and depends both on technological issues and BT's and CPs' migration plans. And over the next three to four years, we thought that the available evidence suggests that technology issues would persist. Therefore, it was considered unlikely that a wholesale product capable of providing a direct constraint on SDH/PDH trunk would become available or that OCPs would switch to greater self-supply of trunk circuits (over their own core capacity). On this basis, for the timeframe of this review, we considered that we should identify a wholesale product market for SDH/PDH trunk only. However, given a degree of uncertainty over these issues, we also proposed to keep trunk market developments under close review.
- 6. Bandwidth breaks: what are the relevant bandwidth breaks that should apply to AISBO, TISBO and trunk markets?**
- 5.21 Ofcom considered that bandwidth breaks identified in retail markets would also apply at the wholesale (AISBO and TISBO) level, because of the derived nature of wholesale demand.
- 5.22 Although TISBO and AISBO are wholesale services, Ofcom first considered market definition at the retail level. This is necessary because the demand for wholesale services such as TISBO and AISBO is a derived demand and depends on the demand for the retail services that those wholesale services support. In general, where the cost of an upstream input accounts for a sufficiently large proportion of the retail price of a product, the range of available substitutes at the retail level will inform the likely range of substitutes for the wholesale service. This is because a rise in the price of a wholesale service that is passed through in the price of one retail service will cause retail customers to switch to substitute retail products, reducing demand for the wholesale input. For these reasons, we based our bandwidth breaks for AISBO and TISBO markets on those identified at the retail level.
- 5.23 On the other hand, we did not identify distinct bandwidth breaks for trunk segments. We reasoned that this is because, unlike in the SBO market, in which the bandwidth of symmetric broadband origination is determined by the bandwidth of the relevant retail leased line, trunk traffic can be aggregated together such that it is economic for higher bandwidth trunk bearer circuits to be used to deliver services at any relevant service bandwidths.

July 2008 consultation

- 5.24 In our July 2008 consultation, we explained why our proposed identification of a further bandwidth break in the retail very high bandwidth TI market would map onto

the TISBO markets. This resulted in the identification of further split in the very high bandwidth TISBO markets between 155 Mbit/s and 622 Mbit/s circuits.

Review of responses to consultations

5.25 In the January 2008 consultation, we asked the following questions:

Question 5: Do stakeholders agree with our proposed wholesale product market definitions? In particular, do you agree with Ofcom that: i) a separate market now exists for high bandwidth AISBOs, and ii) the very high bandwidth TISBO market now includes circuits at bandwidths above 140/ 155 Mbit/s?

5.26 However, part ii) of question 5 in the January 2008 consultation was superseded by our revised proposals in respect of the very high bandwidth TISBO market. Therefore, in the July 2008 consultation we asked the following question:

Question 2: Do stakeholders agree with our proposal to identify separate markets for very high bandwidth TISBO at speeds above 45 Mbit/s and up to and including 155 Mbit/s (TISBO 155 Mbit/s); and wholesale very high bandwidth TISBO at speeds above 155 Mbit/s (622 Mbit/s TISBO)?

Summary of responses

5.27 The following Section summarises respondents' views and our responses to these in respect of our wholesale definitions. We have organised the responses by the six main issues identified in the January 2008 consultation. We cover the specific comments that deal with our proposed wholesale bandwidth breaks raised either in relation to our January and July 2008 consultation questions under Issue 6.

1. Access and Backhaul markets

5.28 Many CPs responding to the January 2008 consultation did not provide specific comments as to whether a combined access and backhaul market existed. The three CPs that commented on this area did not support a combined access and backhaul definition.

5.29 BT highlighted that Ofcom has accepted Undertakings from BT in which 'BT's Backhaul Network' and 'BT's Access Network' are defined separately and different obligations are imposed on backhaul products. BT argued that this would suggest that access and backhaul products have different characteristics and that, even if they are defined as being in the same market, it may be appropriate to reflect differences between them in any remedies imposed.

5.30 One CP did not agree with the combined access and backhaul market mainly because of the inclusion of LLU backhaul in the same market as other AISBO services. In particular, it expressed concern about how this might impact on possible remedies imposed on LLU backhaul.

5.31 One CP argued that we should identify a break between access and backhaul because infrastructure based competition is not sustainable in the access layer whereas, in its view, backhaul was prospectively competitive in some geographic locations. This pointed to variations in competitive conditions between access and backhaul segments (at least in some geographic locations). And in order that CPs

can take advantage of economies of scale and scope in backhaul, it would be preferable to disaggregate access and backhaul services.

- 5.32 The Welsh Assembly Government highlighted that the deployment of alternative backhaul networks such as its own “Fibre Speed³¹” initiative may also challenge, in the near future, the conclusion of a combined access and backhaul market. It considered that there was a high prospect for such changes in the market. It therefore thought that it would be appropriate to keep developments under review.

Ofcom’s response

- 5.33 Ofcom does not consider that within the timeframe of this review it would be appropriate to define separate markets based on variations in competitive conditions between access and backhaul. As we discuss below, while some development in the market might occur in the next four years, we think that CPs will predominantly continue to purchase access and backhaul services together.
- 5.34 The main driver for the demand for separate access and backhaul products is the desire to aggregate a number of lower capacity access segments together onto a single large capacity backhaul link. For this to be worthwhile, the operator must have a sufficient number of access circuits or customers in close proximity to each other.
- 5.35 So far, there has been only limited take-up of separate access and backhaul products (respectively WESA and WESB for the AISBO market and TILLAPs and TILLBPs for the TISBO market), compared to their “bundled” counterparts (i.e. WES and PPCs). In the January 2008 consultation, we suggested that this arises from:
- aggregation opportunities being limited to areas where CPs can aggregate together sufficient numbers of access lines onto main backhaul links;
 - limited opportunities for CPs also to aggregate other types of traffic over the same link (Ethernet, broadband, voice TI leased lines) – referred to as converged backhaul.
 - Some concerns that the disaggregated products for WESs (WESA and WESB) and PPCs (TILLAPs and TILLBPs) that have been available to date have not been fit for purpose.
- 5.36 In the January 2008 consultation, we noted that even if demand had been limited to date, this did not necessarily mean that there would not be growth in the demand for separate access and backhaul services within the timeframe of the review. However, having assessed the underlying drivers and opportunities for CPs to take advantage of separate access and backhaul services, we still thought that CPs would predominantly continue to acquire access and backhaul services together.
- 5.37 Some CPs have argued that there will be demand for separate access and backhaul. But we have not seen further evidence in those responses to suggest that the aggregation and converged backhaul opportunities will be sufficiently material to alter the view that access and backhaul will predominantly continue to be acquired together.

³¹ This is a Welsh Assembly Government public/private initiative supported by European Structural Funds and from GEO, the supplier chosen to build and operate the network. This will provide an open-access fibre network predominantly (but not exclusively) to link business parks in North Wales.

- 5.38 In the January 2008 consultation, and as highlighted in the second bullet above, we consider that the emergence of converged backhaul is likely to be a key driver of demand separate for access and backhaul products. Converged backhaul would mean that CPs could support traffic streams from multiple downstream services (including Ethernet, broadband, voice) over a single backhaul fibre. As set out in the January 2008 consultation, there is a range of factors preventing this occurring at present, including:
- Technical issues: the characteristics and specifications required of wholesale products vary according to the different traffic types. At present the only wholesale products which could support the technical requirements of all services are SDH/PDH or WDM;
 - Interconnection: currently interconnection occurs on service specific platforms at distinct geographic nodes. In many cases nodes for different services are not in the same place which greatly restricts the ability to use converged backhaul; and
 - Investment uncertainty: given the current transition phase to 21CN few operators are likely to invest in their own backhaul products given a degree of market uncertainty and the potential for this to potentially reinforce economic bottlenecks .
- 5.39 These factors together suggested that converged backhaul was unlikely to exist on a sufficient scale to support separate access and backhaul markets.
- 5.40 Some of the CP's were concerned about the effect of a combined access and backhaul definition on the remedies that we might impose. Their concern is that any remedies that might arise out of such a market definition (and SMP finding) would require BT only to provide combined access and backhaul products. We discuss this in more detail in our remedies in Section 8.
- 5.41 However, we note here that the identification of a combined access and backhaul market is consistent with the fact that BT's Undertakings require it to provide distinct WES A (access) and WES B (backhaul) services. As described above, for the reasons set out in the January 2008 consultation, we believe that operators will generally purchase these services together over the timeframe of the review. However, it is possible that some operators will purchase the services separately if the opportunity arises to realise economies of scale in backhaul. The disaggregated products BT makes available are intended to facilitate this.
- 5.42 The Welsh Assembly Government pointed to the deployment of its Fibre Speed project which it described as an "alternative, open-access backhaul infrastructure". It argued that this could lead in the near future to the development of geographic differences in competitive conditions and to the separation of access and backhaul markets. It urged Ofcom to be prepared to revisit the conclusions of this review if this became necessary due to changes in market conditions.
- 5.43 Ofcom will of course continue to monitor market developments from all sources, but our judgement is that, on the basis of the evidence, it is not likely that separate access and backhaul markets will emerge in the timeframe relevant to the review.

Conclusions

- 5.44 Our conclusion is therefore that we should define wholesale SBO markets including both access and backhaul.

2. Alternative interface and TI markets

- 5.45 As with the retail AI and TI markets, there were mixed views as to whether AISBO and TISBO are in the same markets. Various CPs did not agree that separate AISBO and TISBO markets existed (with many pointing to the arguments they presented at the retail level for a combined market definition).
- 5.46 BT noted (in addition to its comments on retail markets) that TDM (TI) and Ethernet technologies used in the transport layer will become interchangeable. Therefore, the retail and wholesale definitions were both defined too narrowly.
- 5.47 One CP argued that separate markets should be defined for services delivered over copper, on the one hand, and for services delivered over fibre on the other. This CP also argued that the differences between AISBO and TISBO were not as stark as we presented in the January 2008 consultation and stated that CPs have tended (wherever viable) to switch to providing retail 155Mbit/s circuits using AI rather than TI interfaces, using the latter only where distance limitations prevent use of AISBO.
- 5.48 Three respondents considered that AISBO and TISBO markets would soon converge. One of those CPs noted that AI services do not currently appear to effectively limit price changes in TI services but it believed that a clear trend exists for customers to move from TI to AI services (and at an increasing rate). Another suggested that this development would accelerate as a number of services likely to become available on BT's 21CN platform would give OCPs a wide choice of potential products to which to migrate (from TI services) including equivalent (or near equivalent) 21CN TDM services, business-grade broadband and Ethernet services.
- 5.49 Another CP argued that its business arm would begin delivering leased lines services presented to customers as SDH/PDH (TISBO) but over Ethernet (AISBO) within 12 months. It suggested that this development would tend to point to an entirely technology neutral definition.
- 5.50 One respondent supported the AISBO / TISBO definition and argued that the technical differences that prevented customers switching at the retail level also exist at the wholesale level.
- 5.51 As with the retail market definitions, many respondents argued for wider markets, in particular including asymmetric broadband (ADSL) services. Some respondents suggested that a wider wholesale market consisting of SDSL, Ethernet in the First Mile, and ADSL should be defined, whilst some argued that an entirely separate business grade ADSL broadband market existed³².
- 5.52 In other cases, respondents considered a wider market consisting of wholesale leased lines and inputs into all other business connectivity services. For example, one respondent argued that the emergence of "Ethernet in the first mile" services would be likely to wholly replace SDSL and to a substantial extent replace 2 Mbit/s TISBOs. It believed that the business grade service wrap would enable it to provide a substitute for SDH-based leased lines services. The respondent further argued that

³² This latter question was addressed in Ofcom's wholesale broadband access market review which can be found at: <http://www.ofcom.org.uk/consult/condocs/wbamr07/statement/statement.pdf>

this could reduce the demarcation between AI and TI services, such that these would now be in the same product market.

- 5.53 In response to the July 2008 consultation, another respondent expressed concern that BT's wholesale product portfolio has grown, now including 20CN and 21CN products. These products address access, backhaul and core requirements, and many combine two or three of these in one offering. It also noted that Ethernet services have now been fully launched and are developing fast. The respondent therefore questioned whether the proposed definitions were sufficiently forward-looking.

Ofcom's response

- 5.54 Ofcom does not agree with those CPs who argued that we should define a wider wholesale market than proposed in our January and July 2008 consultations (i.e. one that includes AISBO, TISBO and a number of other wholesale services in the same market). We consider that separate markets continue to exist for AISBO and TISBO markets. We also conclude that the wholesale product markets should not be defined any wider than this (e.g. to include asymmetric broadband origination). We set out below our further assessment of these issues in light of the comments we received to our consultation.
- 5.55 The principal arguments that CPs put forward against separate AISBO and TISBO largely mirror their arguments in relation to retail markets. For example, CPs pointed to evidence of migration from TISBO to AISBO services and argued that the technologies are largely now the same (or will be in the near future). However, some respondents agreed that AISBO and TISBO services were (currently) in separate markets. One argued that the technical differences that prevented customers switching at the retail level also exist at the wholesale level. One CP in particular noted that AI services do not currently appear to limit price changes in TI services effectively (although the CP thought that they would increasingly do so as migration increases).
- 5.56 As we discussed in Section 3, we believe that retail TI services have particular characteristics that cannot currently be delivered using AI technologies. Given that we conclude that separate AI and TI markets exist at the retail level this would mean that we would not put AISBO and TISBO wholesale inputs in the same market (based for example on an indirect constraint argument)³³. However, it is also necessary to consider whether a direct constraint might arise from, for example, switching to AISBO products to serve both retail AI and TI customers. We explain below why we have concluded that AISBO and TISBO services should be identified as separate product markets.

Assessment of direct constraints at the wholesale level

- 5.57 We note that some CPs suggested that they propose to deliver leased lines services presented to customers as SDH/PDH (TI) circuits using Ethernet (AISBO) inputs in the near future. In addition, one CP noted that wholesale services will become available on BT's 21CN platform and are likely to include TI-presented services provided over the underlying Ethernet-based infrastructure, as well as AI services.

³³ An indirect constraint could arise if the price increase (a SSNIP) on a wholesale input (TISBO) passed onto retail customers results in sufficient TI retail customers switching away from the retail product and so reducing wholesale demand to make the price rise at the wholesale level unprofitable.

- 5.58 This raises the possibility that direct substitution at the wholesale level between TISBO and AISBO services will emerge. Some retail customers may find that the retail TI services provided by a CP using Ethernet based wholesale services, but presented as TI services, are an acceptable substitute for TI services provided using SDH/PDH wholesale services. However, as discussed in Section 3 there appears to be a core of retail customers who still value the intrinsic properties of TDM-based technologies, which Ethernet-based services do not provide, even when presented as TI services.
- 5.59 We think that the fact that BT is continuing to offer access to native TDM services until 2014 suggests that there will be continuing demand for TISBO products to deliver retail TI services. In the coming years. This suggests that the characteristics of TDM cannot yet be fully replicated by AI services. Newer alternative technologies will not provide this core of customers with the underlying characteristics that they value.
- 5.60 We note that some CPs agree that this is currently the case but many also think this will soon change as AI technologies improve. However, no CP was able to provide firm evidence that they are able to supply TI customers on SDH/PDH with Ethernet replacements that still deliver the key characteristics of TDM-based services. But in the absence of clear evidence that this has occurred to an appreciable extent we think it would be premature to conclude that a single wholesale market exists.

Wider wholesale product markets

- 5.61 We discuss here the views of respondents that suggested alternative wholesale product market definitions. Respondents' proposed definitions could be loosely grouped into three broad areas:
- Separate wholesale markets for services provided using copper, on the one hand, and fibre, on the other;
 - A single business connectivity market incorporating leased lines and other connectivity services; or
 - In addition to separate AISBO and TISBO markets, a further distinct wholesale business connectivity market exists for "high-end" ADSL, SDSL and/or EFM.
- 5.62 We address the first bullet separately below before looking at the second and third bullets together (as these issues cover broadly similar product market definition issues).

Separate markets for copper-based and fibre-based services

- 5.63 We explain below why we think copper based and fibre based wholesale services are part of the same market. In the wholesale market, BT primarily relies on copper-based services to supply lower bandwidths (such as TISBO services below 2 Mbit/s). BT uses fibre for its higher bandwidth TISBO services and all current AISBO services. For product definition purposes, it is necessary to consider whether a hypothetical monopolist of one service (e.g. copper-based service) could impose a SSNIP without causing sufficient customers to switch to other products (demand-side substitution), or additional producers to begin supplying this product (supply-side substitution), to render this unprofitable. As with other wholesale definitions, these demand-side constraints may be either direct, with CPs currently using the wholesale

product switching to substitutes, or indirect, resulting from switching by customers for the downstream retail product.

- 5.64 As noted in Section 3, retail customers will in general be indifferent between a service provided over copper and an equivalent service provided over fibre. This is consistent with “technology-neutrality”, the idea that the underlying technology only matters to end users to the extent that it affects prices or quality of service. At low bandwidths the perceived differences are not significant and BT currently provides similar low-bandwidth TI services using both copper and fibre-based wholesale inputs. Indeed some 20% of BT’s 2Mbit/s circuits are provided over copper, and at the same prices as equivalent services provided over fibre, which does not support the identification of separate wholesale services for fibre-based or copper-based services.
- 5.65 Our conclusion is therefore that a copper and fibre-based wholesale product market definition is not appropriate.

Leased lines versus wider business connectivity markets

- 5.66 In Section 3, we discussed in detail our finding that AI and TI services are in separate markets and why we concluded that a wider set of retail business connectivity products are not in the same market. We consider here whether, at the wholesale level, AISBO and TISBO services are constrained by wider wholesale business connectivity services.
- 5.67 We have already concluded in Section 3 that asymmetric broadband and other business connectivity services are not in the same markets as retail traditional and AI leased lines. Therefore, as retail asymmetric broadband prices do not constrain retail leased line prices (to a sufficient degree to place both services in the same market), any indirect constraint on wholesale leased line prices arising from retail level switching to asymmetric broadband access cannot be strong enough to place the corresponding wholesale products in the same wholesale market. It is therefore only necessary to consider whether there are direct constraints at the wholesale level.
- 5.68 On the demand-side, a communication provider currently reliant on PPCs or Wholesale Extension Services would not substitute to using asymmetric wholesale broadband access products such as BT’s IPStream in response to a SSNIP. The asymmetric broadband access would not provide the capabilities of a PPC or Ethernet-based service.
- 5.69 Supply-side substitution might impose an additional constraint if a SSNIP imposed on AISBO or TISBO services would induce sufficient new entry into the market in a relatively short period. As we highlighted in our January 2008 consultation, many communication providers are already present in AI and TI markets as well as providing VPNs and broadband. Therefore, the competitive impact of these suppliers is already captured in the demand-side analysis and they do not impose an additional constraint via the threat of new entry. This means that supply-side substitution is not a relevant factor.
- 5.70 We therefore conclude that wholesale high-end ADSL is not in the same market as AISBO or TISBO.

3. Inclusion of other wholesale services in AISBO and TISBO markets

- 5.71 Those respondents that commented in this area presented views on the inclusion of LLU and RBS backhaul and microwave links in either the AISBO or TISBO markets. Others pointed to other services that should be considered in the AISBO market such as Wave Division Multiplexing (WDM), Ethernet in the first mile (EFM), and backhaul to the cabinet.

LLU backhaul

- 5.72 Two respondents did not agree with the inclusion of LLU backhaul within the AISBO market. One of these respondents argued for a separate LLU backhaul market pointing to the following factors:
- LLU backhaul is used for separate downstream/retail markets;
 - There is zero demand-side substitution between LLU backhaul and other Ethernet products;
 - LLU backhaul employs different parts of BT's network/assets; and
 - Competitive conditions are significantly different.
- 5.73 On this basis, the respondents recommended the separate identification of an LLU backhaul market.

RBS backhaul

- 5.74 One MNO supported the inclusion of RBS backhaul in the same wholesale market as TISBO. One MNO also noted that it would begin to employ Ethernet services for their Radio Base Station backhaul in future.

Microwave links

- 5.75 Another MNO questioned the inclusion of microwave links in the TISBO market. It presented a number of points that it thought would tend to undermine the inclusion of microwave links within this market:
- i) while migrating to radio links might be beneficial in terms of saved operating costs, it thought that high capital outlays would act as a barrier to switching;
 - ii) microwave links have engineering limitations and limited availability (e.g. line of sight restrictions, distance limits);
 - iii) there are increased risks of bottlenecks and reduced reliability as network utilisation increases; and
 - iv) there are limitations in bandwidths beyond 155Mbit/s.
- 5.76 Because of these factors, the MNO did not think it was appropriate to include microwave links as part of our market definition. BT on the other hand questioned in its response to the July 2008 consultation whether we had appropriately included all self-supplied radio links particularly for the 155 Mbit/s market.

WDM

- 5.77 Two respondents questioned the exclusion of WDM from our wholesale product market definition. One respondent did not agree that such services should be excluded on the basis of bandwidth breaks or based on the functionality of WDM. Both respondents highlighted the use of WDM as an input to many of the wholesale circuits within this market. One of the above respondents argued that if WDM circuits were outside the scope of the business connectivity review then they would need to be reviewed as part of the proposed dark fibre review.

Backhaul to the cabinet

- 5.78 One CP argued that although CPs are yet to deploy backhaul to the cabinet³⁴ it should be included in the same relevant market as LLU backhaul. It suggested that Ofcom provide clarity that this would be the case.

Ofcom's response

- 5.79 We comment below on the inclusion of LLU and RBS backhaul and microwave links in either the AISBO or TISBO markets. In addition, we consider the arguments CPs put forward in support of the inclusion of other services such as Wave Division Multiplexing (WDM), Ethernet in the first mile and backhaul to the cabinet within the AISBO or TISBO markets.

LLU backhaul

- 5.80 For the reasons set out below, we do not think that the available evidence points to the identification of LLU backhaul as a market separate from other AISBO services. We consider in turn each of the arguments presented by respondents.

LLU backhaul addresses a separate retail markets

- 5.81 One respondent argued that, as LLU backhaul and AISBO serve different downstream retail markets, they should be regarded as falling in separate wholesale market. However, our view is that wholesale inputs which are used to support different retail markets do not necessarily fall within separate wholesale markets.
- 5.82 In general, there may be a number of reasons to regard two wholesale products as part of a single market. These include direct demand-side substitution at the wholesale level, indirect demand-side substitution via the impact of wholesale price increases on retail prices and retail demand, supply-side substitution, the existence of a common pricing constraint and homogeneity of competitive conditions. Of these, only one, indirect demand-side substitution via the retail level is ruled out if the two products serve distinct retail markets. It is clear therefore that, in the specific case of LLU backhaul and AISBO, it is possible for them to be part of a single market if any of the other reasons (direct wholesale level substitution, etc) apply. These are discussed below.

LLU backhaul uses different network components

- 5.83 Some respondents argued that LLU backhaul and dedicated Ethernet connectivity services would employ different parts of BT's network/assets and should therefore be

³⁴ Backhaul to the cabinet would involve providing a connection between a CP's network POC and one of BT's street cabinet for the purpose of backhauling broadband traffic.